The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 21. MAY 24, 1941. VOL. 53.

COMMERCIAL LIVE BR. *ABORTUS* VACCINES

W. T. ROWLANDS AND H. E. HARBOUR

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR

A review of the considerable literature that has appeared on the subject of preventive inoculation of cattle against infection with *Br. abortus* indicates that *dead* vaccine is regarded as of little or no value, while opinion is somewhat divided on the value of *live* vaccine. Apart from the doubt expressed by some in relation to its intrinsic value, the public health aspect of its use has added to the difficulty of forming a definite opinion on the subject. There is a tendency at the present time to attach increasing importance to the *virulence* of such vaccines. The Survey Committee of the National Veterinary Medical Association, in its "Report on Diseases of Farm Livestock" (1941), has urged the use of vaccines of *standardised* virulence. Dalling (1940), in discussing control of contagious abortion, states: "the use of virulent cultures cannot be defended on any pretext; the risk is much too great. The experiments with non-virulent living cultures carried out in America and to a limited extent in this country are, however, encouraging and we can, I think, look forward with a fair degree of confidence to a more general application of the method." The results of these various experiments on cultures of diminished virulence have already been translated to commercial advantage with the result that "attenuated" and "avirulent" vaccines have already made their appearance on the market together with the ordinary live vaccines. It is obvious that commercial vaccines, as they appear to-day, may vary considerably in virulence since no form of official standardisation is practised.

In view of the extreme urgency for controlling contagious abortion as a war emergency measure and the increasing importance attached to the use of live vaccination to this end, it is considered timely to place on record the results of an investigation of commercial live brucella vaccines offered for sale at the present time.

As far as the writers are aware, no previous investigation of this kind has been reported in this country. In America, Torrey and Hallman (1930) investigated nine commercial live *Brucella* vaccines. Three of these were found to be non-viable and a fourth to contain only a few viable organisms. Three of the vaccines "showed more virulence for guinea-pigs than many recently isolated strains from aborting cattle." Since that time the American Bureau of Animal Industry has exercised complete control of commercially produced *Brucella* vaccines and latterly has favoured the exclusive use of vaccine prepared from their attenuated Strain 19. The present investigation was planned primarily with a view to determining whether any vaccines now on sale contained highly virulent strains and in what respects "attenuated" or "avirulent" vaccines differed from other available "live" vaccines. While it was not possible without exhaustive tests using large numbers of guinea-pigs to assess accurately the virulence of these vaccines, it was felt that limited tests would reveal any obviously virulent strains and that cultural examination would give an index of viability and purity.

EXPERIMENTAL

It has been possible in this way to investigate eight *Brucella* vaccines purchased through the usual commercial channels. The following particulars regarding these as received are of general interest and importance to the investigation:—

TABLE I

Vaccine.	Date of Testing.	Expiry Date.	Interval (days).	Nature.	Dose.
N	4/12/40	None given	—	Broth culture	30 c.c.
O	4/12/40	15/2/41	73	Broth culture	20 c.c.
P	4/12/40	16/12/40	12	Broth culture	50 c.c.
Q	4/12/40	26/1/41	53	Saline suspension	10 c.c.
R	4/12/40	None given	—	Saline suspension	10 c.c.
S	4/12/40	Date of issue only	—	Saline suspension	25 c.c.
T	4/12/40	5/4/41	122	Broth culture	20 c.c.
V	16/11/40	—	—	Broth culture	5 c.c.

Note.—Vaccines O, T and V were from the same manufacturer, O and T being purchased from two different distributing agents and bearing different batch numbers and expiry dates. V was an "avirulent" vaccine advertised as being of value for the inoculation of pregnant cattle. This vaccine was purchased at a different time from the others and, unfortunately, the dates of manufacture and expiry were not recorded. The vaccine was tested, however, immediately after receipt and it is known that the expiry date had not been reached. Q and R came from a single distributing agent but were from different manufacturers, R being an "attenuated" vaccine.

Cultural Tests

Following the examination of Gram-stained smears and the determination of the strength of the suspension by means of Brown's opacity tubes, a standard suspension of each vaccine containing approximately 500×10^6 organisms per 1 c.c. was prepared. From this suspension two further dilutions, $1/10^3$ and $1/10^5$ were then prepared. Finally, 0·1 c.c. of the standard suspension and of each dilution thereof were inoculated on to each of two liver agar plates. In addition, 0·1 c.c. of the standard suspension was inoculated on to each of two dye plates (liver agar containing 1 : 250,000 gentian violet and 1 : 250,000 malachite green). One set of plates was then incubated aerobically and the other set in an atmosphere containing 10 per cent. CO_2 at 37° C. for ten days. Colonies were then examined and the numbers of *Brucella abortus* colonies developing on the plates sown with the various dilutions were estimated. In this way an indication of purity and viability was obtained.

Biological Tests

Guinea-pigs and mice were used in this work in determining the virulence and toxicity of the *Brucella* strains. Four guinea-pigs were used for each vaccine. Two were inoculated each with 1/100th of the dose recommended for cattle by the producers. The remaining two pigs received respectively 1 c.c. of $1/10^3$ and $1/10^4$ dilutions of a suspension standardised to tube No. 4 in the Brown scale. Inoculations were made intramuscularly in all cases. There was one exception to this routine in the case of vaccine V, when doses of 1 c.c. of the neat vaccine were inoculated into each of two guinea-pigs and 1 c.c. of a 1 : 100 dilution of the vaccine into each of two others. The guinea-pigs were killed and examined five weeks later. For this purpose the spleen was removed and weighed with sterile precautions, the presence of macroscopic changes being noted, and finally was cultured on liver agar plates in duplicate and incubated aerobically and in 10 per cent. CO_2 at 37° C. A blood sample was taken for the determination of specific agglutinins.

Toxicity tests in mice were conducted on all but two vaccines (O. & R.) in accordance with the method of Priestley and McEwen (1938) using fresh suspensions made from subcultures of the original liver agar plates sown with the respective vaccines, no attempt being made to select single colonies. These tests could not be carried out with the original vaccines since the suspension required in this test must be freshly prepared and fully viable and a very considerable quantity of the vaccine itself would have been required in each case. It was realised that this practice might fail to detect a virulent strain if present in a multi-strain vaccine as the less virulent would tend to outgrow the more virulent strains. The resulting inoculum might not therefore reflect the true state of affairs in the original vaccine. With a single strain vaccine the test would be quite useful in determining roughly the degree of virulence. The technique employed was, briefly, as follows :—Saline suspensions prepared from 48-hour growths on liver agar were standardised by means of opacity tubes to contain in each 1 c.c. 32, 16, 8, 4, 2 and 1 thousand million organisms respectively. Groups of five mice were allotted to each suspension, each mouse receiving 0·5 c.c. of the appropriate suspension intraperitoneally. Thus the mice in the respective groups each received doses of 16, 8, 4, 2, 1 and 0·5 thousand million organisms. The numbers of mice dying within four days of inoculation were recorded.

Results

Results of guinea-pig tests, together with notes on opacity and viability, are recorded in Table No. 2, while Table No. 3 shows the results of mouse toxicity tests.

Table III

Showing the Toxicity for Mice of Strains of Br. abortus *recovered from six live vaccines. Results of similar tests of a known non-virulent strain and a virulent strain are quoted from McEwen's work for comparison*

Strain	Nos. of Organisms Inoculated in Thousand Millions					
	16	8	4	2	1	0·5
Vaccine N	3	2	2	1	0	0
Vaccine P	5	5	1	0	0	0
Vaccine Q	5	1	0	1	0	0
Vaccine S	4	5	5	3	1	0
Vaccine T	5	2	0	0	0	0
Vaccine V	5	5	3	1	1	1
McEwen 45 (non-virulent)	5	1	1	0	0	0
McEwen Russell (509) (virulent)	5	5	5	5	5	1

Figures = Numbers dying out of 5 inoculated.

It will be seen that dosage varied from $1,500 \times 10^6$ organisms in the case of the "avirulent" vaccine V, to $437,500 \times 10^6$ of the vaccine S. Viability also varied considerably, and in only three, P, Q and S, could viability be classed as good. The manufacturers of P gave an expiry date only a few days after receipt of the vaccine by the user, those of Q gave an expiry date 53 days after receipt, while those of S gave a date of issue only. A consideration of the expiry dates of vaccines O and T made by the same firm shows that this firm allows for a storage period of *at least* four months. It is interesting to note that vaccine O, which was tested as much as 73 days before its expiry date, showed only poor viability. Vaccine T, tested 122 days prior to its expiry date, showed a better viability though this could only be described as "moderate." A curious feature with the latter vaccine was the fact that growth was better in the case of the plates inoculated in an atmosphere containing 10 per cent. carbon dioxide, though later sub-cultures grew equally well aerobically. This suggested the presence of a comparatively recently isolated strain but the guinea-pig tests gave little indication of virulence beyond a slight splenic enlargement in two cases. A strain isolated from one of these pigs and cultivated in an atmosphere of 10 per cent. carbon dioxide was no more toxic for mice than the strain from the original vaccine. Vaccine V, the "avirulent" vaccine from the same firm, showed very poor viability, and this fact very materially affected the dosage given in the test guinea-pigs. Thus on a basis of colony counts it was estimated that the vaccine contained probably not more than 300 viable organisms per c.c. The largest dose given to a guinea-pig, therefore, would

TABLE II

Showing the opacity, dose, viability and results of guinea-pig inoculations of eight commercial Br. abortus *vaccines*

Vaccine.	Dose c.c.	Opacity millions per c.c.	Estimated dose (cattle) millions of organisms.	Viability.	Guinea-Pigs			
					1/100 Cattle.	1/100 Cattle.	Tube 4 $1/10^3$.	Tube 4 $1/10^4$
N	30	100	3,000	Moderate	C — B — L —	DP	DP	C — B AC 1/20 Tr 1/40 L —
O	20	3,250	65,000	Poor	C — B — L —	C — B — L —	C — B — L —	C — B — L —
P	50	1,500	75,000	Good	DP	C + B not done L sl. splenic enlargement	C + B + 1/80 L —	C + B + 1/80 L —
Q	10	1,000	10,000	Good but contaminated	DP	C — B — L —	C — B — L —	C — B — L —
R	10			Heavy growth of contaminants only	C — B — L —	C — B — L —	C — B — L —	C — B — L —
S	25	17,500	437,500	Good	C + B + 1/80 L —	C + B AC 1/320 L sl. splenic enlargement	C + B Sl. 1/320 L sl. splenic enlargement	C + B not done L —
T	20	700	14,000	Moderate	C + B not done L sl. splenic enlargement	C — B + 1/20 L —	C — B Sl. 1/10 L Sl. splenic enlargement	C — B — L —
					1 c.c.		1 c.c. $1/10^3$	
V	5	300	1,500	Poor	C — B — L —	C — B — L —	C — B — L —	C — B — L —

C = Spleen culture. B = Agglutination test blood. (+ = complete. AC = almost complete) (Sl. = slight. Tr. = Trace) L = Lesions. DP = Died prematurely.

be such that even a fully virulent strain might fail to infect in all cases. The value of a dose of 1,500 organisms as an immunising dose in cattle, moreover, appears very doubtful. Thus McEwen, Priestley and Paterson (1939), in the course of a search for a suitable infective dose for testing of immunity in cattle, inoculated ten pregnant heifers with doses of 1,460 organisms of a virulent strain of *Br. abortus*. Infection was demonstrated by agglutinin response and isolation of the organism from placenta only in two of the nine animals calving. No evidence of infection could be shown in any of the others and all calvings were normal. It is unfortunate that no record was kept of the expiry date of this vaccine, but the vaccine was purchased in the usual way and tested on receipt, and it is known that the expiry date had not then been reached. Even supposing that the test was made only shortly before the expiry date there would seem to be little excuse for the poor viability noted. In the case of vaccine Q viability was good, but slight contamination with *staphylococci* was noted. Vaccine R, the "attenuated" vaccine from the same manufacturer, showed numerous minute Gram-negative rods on smear, but there were also large numbers of Gram-positive cocci. On cultural examination there was a profuse growth of *staphylococci*; *Brucella abortus* failed to grow. Attempts were made to isolate *Brucella abortus* by heavy sowings on dye plates. Similar plates were also sown with the centrifuged deposit from the vaccine and also with the deposit following treatment of the vaccine with an abortus-agglutinating serum. All attempts to isolate *Brucella abortus* failed and it was concluded that the vaccine was non-viable. The contaminants in the case of both vaccines R and Q were non-pathogenic varieties of *staphylococci*.

Virulence tests in guinea-pigs were somewhat inconclusive owing partly to the variation in viability and partly to limited numbers of guinea-pigs available. The results in the case of vaccines of poor viability need hardly be considered; of the remainder slight splenic enlargement was caused in a few cases

(P, S and T) while persistence of the organism in all pigs was recorded with Vaccines P and S. There was no indication that any vaccine contained fully virulent strains.

Mouse toxicity tests suggested that vaccine S was more virulent that the others which were of uniformly low virulence. If comparison is made with the various results of mouse toxicity tests recorded by Priestley and McEwen (1938) and McEwen (1940) it will be seen that vaccine S strain appears to be of moderate virulence—perhaps more virulent than McEwen's Strain 45 (20) but not fully virulent. The result of the mouse test with vaccine V is of particular interest. This vaccine is supposed to be an "avirulent" vaccine for inoculation of pregnant cattle, yet the strain recovered from it exhibited significantly greater toxicity for mice than the strain recovered from the ordinary live abortus vaccine (T) issued by the same firm, being second only to vaccine S in this respect. As has been pointed out, this vaccine was of such low viability that a considerable quantity would have had to be purchased and concentrated by centrifuging before a reasonable test dose for guinea-pigs could have been attained.

DISCUSSION

The results of these few observations indicate that the commercial preparations of *Brucella abortus* live vaccine, while possibly not dangerous on the score of virulence (with the possible exception of vaccine S), leave a lot to be desired. It is evident that a live abortus vaccine is a product that needs to be freshly prepared and that an ill-founded optimism prevails among some manufacturers regarding maintenance of viability during storage. There are obvious commercial advantages in storing vaccines in bulk but the practitioner has the right to expect a fully viable product. The nature of the vaccine seems to be of importance likewise. There is something to be said both for and against the use of broth as a medium for live abortus vaccine. Its use reduces the handling of the product to a minimum and so reduces the possibility of contamination. On the other hand, the broth offers a splendid medium for the growth of any contaminants which may enter during the process of bottling. Further, such vaccines are of necessity weak suspensions and call for the inoculation' of large volumes to reach a reasonable dose of organisms. Finally, prolonged growth in broth may favour the development of rough variants, and while this may be an advantage in that animals so vaccinated will show less reaction to a blood test, it would be necessary to be certain that such rough strains were still fully capable of stimulating an immunity response.

It is pleasing to note that no fully virulent strain of *Br. abortus* was encountered in this work, although the results with one vaccine (S) suggested it might be of only moderately reduced virulence. It is tentatively suggested that this vaccine might be capable of causing udder infection. There seems every reason to support the view of the Survey Committee that only vaccines of standard virulence should be used. It is evident that such vaccines must of necessity be prepared from a single strain showing *constant properties* of virulence such as, *e.g.*, Strain 19 and possibly Strain 45 or its derivatives. It is suggested that the variable results in the field which have been experienced in the past may have been due to variation in viability and virulence of the vaccines used.

The contamination of vaccines cannot be defended on any grounds, and particular condemnation in this respect is earned by two vaccines, Q and R, both marketed by the same firm. A previous examination of vaccine from this firm showed no viable organisms other than a Gram-positive coccus, all attempts to isolate *Br. abortus* failing completely. Thus of three samples examined from this firm two have contained no viable *Br. abortus* while all three have been contaminated.

Special interest attaches to vaccine V. This is claimed to be "avirulent" and suitable for the inoculation of pregnant cattle and with vaccine R, which showed an absence of viable *Brucella*, is typical of the commercialisation of the results of research work by McEwen and American workers in relation to avirulent and attenuated strains. The results suggest that in the case of vaccine V little attempt has been made to decide whether or not it is what it is claimed to be, for from these observations it is seen to be more toxic for mice than the strain isolated from live *abortus* vaccine produced by the same firm. When it is recalled that this vaccine is claimed to be safe for the inoculation of pregnant cattle and that there is nothing to prevent the uninitiated from having direct access to it over the chemist's counter, one cannot too greatly deplore the circumstances which permit this.

In view of the observations presented the authors wish to draw attention once again to the really urgent need for official control of veterinary biological products. They appeal especially to the Committee of the N.V.M.A. dealing with this matter to increase its pressure upon the necessary authorities. Such control in the case of *Brucella* vaccines should, it is thought, take into consideration the following points:

(1) The absolute prohibition of the sale of such vaccines except to veterinary surgeons. The danger of the present indiscriminate sale is obvious.

(2) The provision of strains of *Br. abortus* of a *constant standard virulence* for issue to manufacturers —the method of preparation, strength of suspension and dose being standardised. Vaccines should be *single strain* vaccines.

(3) The provision of a time limit and conditions under which such vaccine might be stored and maintain fully its essential viability.

The selection of suitable standard strains must be governed by a comprehensive knowledge of the virulence of these strains not only for guinea-pigs but for cattle also. Strains of moderately high virulence could be used for the vaccination of calves (four to eight months) while one of lower virulence would be necessary for the inoculation of older cattle. Where vaccination in adult animals is practised strains used must be constantly incapable of causing udder infection. Thus standardised there could be no possible risk to public health through the use of such vaccines, rendering unnecessary the Ministry of Health's ban on the use of live vaccine in designated tuberculin tested herds. Indeed, the authors consider that this ban should be raised now, since it does more harm than good by hindering the control of contagious abortion which causes great losses in a large proportion of such herds.

Summary

1. Eight samples of live *Brucella abortus* vaccines from six distributing firms, including two vaccines advertised as "attenuated" and "avirulent," were studied by direct cultural examination and inoculation of guinea-pigs. Strains cultured from them were subjected to mouse toxicity tests.

2. Viability was good in three vaccines, moderate in two and poor in two, while the remaining vaccine contained no viable *abortus* bacilli.

3. Two of the vaccines were heavily contaminated.

4. Virulence tests were somewhat inconclusive but as far as could be ascertained no vaccine contained fully virulent strains. Three vaccines caused slight splenic enlargement in some guinea-pigs inoculated. Mouse toxicity tests suggested that one of these was of moderate virulence.

5. The strain cultured from an "avirulent" vaccine proved more toxic for mice than the strains from the normal vaccines from the same manufacturer.

6. The official control by standardisation and restriction of sale of live *Brucella* vaccines is urged.

References

N.V.M.A. Report on Diseases of Farm Livestock (1941). *Vet. Rec.* **53.** 3-14.

Dalling, T. (1940). *Ibid.* **52.** 611-614.

Torrey, J. P., and Hallman, E. T. (1930). *J. Amer. vet. med. Assoc.* **76.** 7-16.

Priestley, F. W., and McEwen, A. D. (1938). *J. comp. Path.* **51.** 282-289.

McEwen, A. D. (1940). *Vet. Rec.* **52.** 907.

——, Priestley, F. W., and Paterson, J. D. (1939). *J. comp. Path.* **52.** 116.

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at Hotel Lindum, St. Anne's, Lytham St. Anne's, Lancs.

	Price net s. d.	*Post free* s. d.
House of Commons Papers:		
28. Development Fund. Abstract Account of the Receipts into and Issues out of, the Fund, 1939-40; together with the Report of the Comptroller and Auditor General thereon	0 2	0 3
Statutory Rules and Orders:		
578. Personal Injuries (Civilians) Regulations, April 30	0 2	0 3
Scientific and Industrial Research, Department of:		
Water Pollution Research Board. Summary of Current Literature Vol. XIII. No. 11, November, 1940. Abstracts Nos. 1246-1352. (47-81-11-40)	2 0	2 1

* * * * *

Weekly Wisdom

A steady sounding note is explained as the outcome of vibrations in the air; a steady colour is explained as the outcome of vibrations in ether. If we explain the steady endurance of matter on the same principle, we shall conceive of each primordial element as a vibrating ebb and flow of an underlying energy or activity.—Whitehead: "Science and the Modern World," p. 50.

If science is not to degenerate into a medley of ad hoc *hypothesis, it must become philosophical and must enter upon a thorough criticism of its own foundations.*—Ibid.

Economies from Routine Veterinary Examinations of Dairy Herds*

J. J. MacGREGOR, B.Sc., M.Sc., B.Litt.

Department of Economics, Harper Adams Agricultural College

When the Agricultural Research Council first surveyed the research needs of the country it decided that the most urgent subject of enquiry was animal diseases. In reaching this conclusion a Report of the Council pointed out that "the safeguarding of the health of farm animals is more important than it has ever been, and the establishment of the State Veterinary Service now in process of formation is the most prominent of the indications of the increased regard which is being given by the Government to this aspect of stock farming."

In order to illustrate the scope for improving the efficiency of farms on the issue of disease alone, this article (*a*) seeks to give some idea of the effects of disease in financial terms, and (*b*) refers to a method of routine veterinary examination which has been advocated to meet the traditional neglect of common diseases by farmers.

The cause of disposals from dairy herds has been the object of several studies. These have emphasised indirectly the seriousness of the financial loss wrought by disease, much of which is preventable, or at least controllable, provided certain precautions are taken. In peacetime such easy tolerance is a crime against efficiency, but in war-time it is a crime against the nation, for it represents waste in the vital business of food production.

Some idea of the relative importance of the various causes of disposal can be gathered from the following evidence.

Causes of the Disposal of Dairy Cows[1]

	Summary of three Investigations.
Number of herds	2,830
Number of cows in herds	78,905
Number of disposals recorded	17,247
Percentage of these disposals recorded as being on account of:	
(1) Diseases of the reproductive organs	
(*a*) Sterility	23·8
(*b*) Abortion	3·0
Total reproductive disease	26·8
(2) Udder disease	7·7
(3) Tuberculosis, Johne's disease and wasting	9·7
(4) Death and miscellaneous diseases ...	10·4
(5) Tuberculin test	3·6
Total from disease	58·2
(6) Old age	4·3
(7) Accident	1·5
(8) Low Yield	17·7
(9) Trade	18·3
Total	100·0

(1) Summarised from Economic Advisory Council, Committee on Cattle Diseases Report. Cmd. 4591 H.M.S.O., 1934, p. 11.

An outstanding feature of the above table is the loss due to sterility, which is due to a number of causes of which infection with contagious abortion is recognised to be one of the most frequent. The evidence also

* Reproduced from *The Farm Economist* (Vol. III, No. 8, 145-148, January, 1941). [Published by the Agricultural Economics Research Institute, Oxford.]

emphasises that mastitis, tuberculosis and Johne's disease are common causes of loss in dairy herds, yet the effect of these can be mitigated to a great extent if certain elementary steps are carried out at frequent intervals. The evidence in the table implies a short productive life for the average dairy cow, and more recent studies[2] corroborate this and other general aspects of the table. The average life tends to be about half of the possible span of usefulness.

Attempts to measure the cost of disease in terms of money meet with obvious difficulties. Where disease causes, say, a reduction in the yield of milk the amount of loss can only be calculated against the normal curve of milk production of the particular animals in circumstances of normal health and management.

Estimates of the total loss in Great Britain from disease vary over wide limits. The Report of the Economic Advisory Council estimated that the curtailment of the life of dairy cows due to various causes was responsible for an annual monetary loss of over £3,000,000, of which £2,500,000 was due to the increased cost of maintaining herds at their full strength, and the remainder to meat condemned on account of disease. A more recent estimate of dairy cow diseases is that of £20,000,000, in the Report on Diseases of Farm Livestock by the National Veterinary Medical Association. This amount refers only to losses from mastitis, sterility, abortion and Johne's disease, and is based on a dairy cow valuation of £42 10s. 0d. Professor H. D. Kay[3] assumes that a loss of £2,500,000 per annum is a highly conservative estimate of the loss due to mastitis alone (based on a loss of 4 per cent. in the quantity of milk, without allowing for any reduction in quality and food value). Reference is made to the high proportion of cows with low quality milk which have mastitis infection.

The first and second of these estimates represents a loss of approximately £1 and £7 per cow on all cows in Great Britain, but it is obvious, in view of the varying incidence of the diseases in different parts of the country, that on individual farms actually suffering from severe outbreaks the loss per cow would be very much greater.

Where careful records have been kept, a fairly accurate measurement can be made of losses caused by specific outbreaks of disease. As an example, in a recent study[4] of the economic significance of contagious abortion in two tuberculin-tested herds an estimate has been made of the direct money losses due to (*a*) loss of calves, (*b*) depreciation in the value of the cows, and (*c*) reduction in milk yields. It is important to note that the farms are run on efficient commercial lines. The dairy stock on Farm A contained about 30 cows and 40 young stock, and on Farm B 60 cows and 80 young stock. The economic data of this study can best be summarised as follows:—

Direct Losses Attributable to Contagious Abortion Over Five Years on Two T.T. Farms

	Farm A		Farm B	
	£	%	£	%
Loss of Calves	115	12	237	14
Depreciation, including Deaths	337	37	538	32
Loss of Milk Yield	478	51	926	54
Total	930	100	1,701	100

An important qualification made in the study was that the losses represented only the *immediate* cost and did not include any part of the *ultimate* expenses such as the disruption of the breeding policy in a self-contained herd.

The depreciation in the value of cows due to death or sale for reasons directly attributable to contagious abortion amounted in both farms to about one-third of the total loss. The figures only include losses arising from disposals and do not make allowance for any temporary decrease in the value of cows retained for further breeding. Aborting cows which escaped both sterility and second abortion regained their full value as dairy cows. Among the after-effects of the outbreak on one of the farms it was noted that 40 per cent. of the aborting cows became sterile and that the remainder were, as a rule, slow breeders. As the herds were a dual-purpose breed the reduction in value of the cows sold for beef was naturally less than if they had been a milking breed. The greatest direct loss was due to the decline in production of milk in the lactation following abortion. The estimated reduction in yield represented 244 and 362 gallons (or 35 per cent. and 36 per cent.) respectively per cow on the two farms. The total loss of £2,631 for the two farms was actually higher than the total average capital of £2,450 invested in the dairy herds, and reckoned as a charge on the capital value of the herd was equal to 24 per cent. per annum over the period to which the study related. These direct losses thus totalled approximately £6 per cow.

While it is admittedly difficult to generalise from the results of two farms, the extent of the loss from what is an ordinary outbreak of the diseases makes one realise the economic possibilities and needs of disease prevention.

As most farmers agree with the contention that the productive life of dairy cows is very much shorter than the theoretical expectation, it is surprising that a general air of apathy exists towards preventive and control measures. There is a feeling that most of the havoc caused by certain outbreaks of disease is inevitable and just one of the risks of farming. At any rate, judging from the extremely small size of veterinary bills on the average farm (as shown by figures relating to West Midland farms), it would seem that the veterinary surgeon is only called in when an accident or obvious illness has developed.

In view of the urgency of the problem it should be of general interest to farmers that the National Veterinary Medical Association has been exploring the possibilities of a scheme for controlling the more important diseases, which would take the form of routine examinations at a small fee per cow in each herd. The possibilities of such a scheme in dealing with sterility problems alone—already shown to be a very common cause of wastage in dairy herds—are considerable. As a result of research it is now possible to determine whether sterility is permanent or temporary, and in the latter event to reduce the wasteful delays of otherwise "shy" breeding cows. In view of the scale of this and other troubles arising in the average herd it is obvious that even a fairly substantial fee would be well repaid in extra production and could be regarded as a form of insurance. Moreover, it would be in line with national long-term policy for the eradication or control of certain diseases and should help significantly to provide the immediate increase in the quantity and quality of food which is so essential to the welfare of the nation at war.

(2) G. H. N. Pettit: *Wastage, Length of Productive Life, Replacement and Depreciation of Dairy Cows.* The Journal of Agricultural Science, Volume XXX, July, 1940.

(3) *Some Recent Advances in Dairy Science.* Nature, January 11th, 1941, p. 43.

(4) J. R. Currie. *The Economic Significance of Contagious Abortion in Two Tuberculin-Tested Herds.* Scottish Journal of Agriculture, Volume XXII, April, 1939.

Some Records of Parasitic Aneurysm in Clinically Affected Horses*

(*Continued from Page* 282.)

Discussion

[Before the paper was opened for general discussion, Mr. Ottaway, in reply to Professor MILLER'S enquiry as to the conditions under which the animals had been kept, said they had been kept on Thames marsh land, and Dr. McCunn commented: "The Thames marshes are bad pastures." Mr. E. G. WHITE then asked if there was any previous history of colic which might have been associated with the aneurysms. In the course of dissection were any lesions due to strongyle larvae found in the thoracic part of the aorta?]

Mr. G. P. MALE, opening the general discussion, said that, first of all, he should like to express his indebtedness for the paper and demonstration. Most practitioners were concerned with strongylosis in equines.

Had the lungs been examined for *vulgaris* larvae? He asked this because about 20 years ago at a Conference at Cambridge he expressed the opinion, as the result of clinical observations on badly affected cases in young animals, that these larvae migrated through the lungs and up the trachea—and that had been borne out by recent investigations.

It would be interesting to know the pathological significance of these aneurysms, as so many were found at *post-mortem* examinations in apparently healthy horses. In fatal cases that he had seen there had often been an acute enteritis. He remembered one case especially, of a foal just previous to weaning that was in good condition, but died after an illness of a few hours. A *post-mortem* examination revealed the presence of enormous numbers of parasites, the whole of the bowel content vibrating with their movements. The large intestines were inflamed and thickened and on holding up a piece of the bowel encysted embryos and innumerable minute punctures could be seen. He thought death was due to enteritis and bacterial infection through the damaged bowel, and not so much to interference with the circulation or nerve supply. Was any attempt made to treat the animals examined by the essayists? Fortunately with oil of chenopodium and phenothiazine it was now fairly easy to deal with strongyles, if the animal's strength was maintained with easily digested food, especially large quantities of skimmed milk.

He was very interested to hear that parasites other than *vulgaris* had been found in the aneurysms.

Mr. C. FORMSTON asked if the condition in all cases was definitely aneurysm, or was it not in some merely arteritis and thrombosis? Did Mr. Ottaway make an examination of the living animals to observe the symptoms and note the changes over a period of time? Was thrombosis always complete or in some cases was the vessel only partly occluded? Was there any possibility of the vessel becoming patent again, consequent upon organisation and contraction of the thrombus?

Professor J. G. WRIGHT said that he was most interested to hear that Mr. Ottaway was able to detect the aneurysm in life by rectal palpation. He assumed the ponies with which he was dealing were 12 to 13 hands. Did he think that diagnosis could be made with equal facility in animals of 15 to 16 hands? He would ask the openers what part the aneurysm played in the pathogenesis of the condition. Was the emaciation due to the presence of the parasites in the intestinal wall, or to interference with the blood supply to the bowel? Was there any evidence of embolism in the bowel? Would Miss Bingham tell him if blood examination revealed true anaemia, and were any of the parasites blood suckers?

Regarding the weakness of the hind quarters, he understood Mr. Ottaway to say that this was due to the presence of fibrous tissue about the sympathetic ganglia. Was it found that there was fibrosis around the nerves of the lumbo-sacral plexus, or was it suggested that the hind leg weakness was due to interference with the circulation in them? He did not understand how pressure on the sympathetic ganglia in the sublumbar region could cause motor paralysis of the hind legs.

Dr. J. H. OLDHAM observed that he should like to mention, in anticipation of Miss Bingham's reply to Professor Wright, that the equine strongyles appeared to be primarily tissue feeders. The worms attached themselves to the mucosa by drawing into the buccal capsule a plug of tissue which was later digested and liquefied by secretions of the oesophageal glands. Occasionally blood vessels, capillaries and the like, were ruptured and blood was ingested with the tissue. *Trichonema* species, which possessed relatively shallow capsules, attacked only the superficial layers of the mucosa and drew very little blood; species of *Strongylus*, on the other hand, which had large buccal capsules, sucked in larger portions of the mucosa or cut into the tissue by means of their teeth and ingested larger quantities of blood. When the tissue plug had been digested the worm moved to a new site, thus leaving a denuded area. Any anaemia that might develop was due, therefore, to blood ingested accidentally, and to some extent deliberately, and to mechanical loss due to escape of blood from denuded areas. It was of interest to note, in passing, that no specimens of *Strongylus equinus* were recorded from these ponies; this species would appear to be comparatively rare in this country.

Replying to Mr. Male, Dr. Oldham said that the colour of the parasites was due to ingested blood.

Mr. MALE commented that that was curious, as the so-called red worms caused less tissue damage than other species, and yet were red, while the others were white.

Professor G. H. WOOLDRIDGE stated that he would like to be sure that he had got accurately the life history as suggested by the reporters, namely, that the embryos penetrated the intestinal wall and were carried *via* the liver to the lungs and after passing into the bronchi were carried to the pharynx and swallowed, thus infecting the intestine. This did not account for the presence of larvae in the aneurysm. The writers got over that difficulty by suggesting that the aneurysmal parasites were aberrant. It was remarkable that there should be so large a proportion of such aberrant forms and no parasites found in the lungs in the suggested natural course. He could not accept that hypothesis. He considered that the embryos after penetrating the bowel wall migrated by some unknown track to their predilection seats in the *vaso vasorum* of the large abdominal arteries. In these capillaries of the vessel wall they continued their development and, increasing in size, damaged the vessel wall and the intima, causing arteritis. Thus a thrombus was formed. The parasites continued to grow in the blood clot. With the weakened wall and the obstruction by the thrombus, the wall dilated, and the aneurysm was formed. There was no doubt that numbers of parasites were actually enclosed within the thrombus in the large arteries, and they were swept off with bits of the thrombus and were responsible for embolism of the smaller arteries and the bowel wall, which was partly responsible for colic. Colic was also due to earlier developmental stages of the parasite, during thrombosis of a large vessel in the roof of the abdominal cavity: this caused a mechanical obstruction to the blood supply of the intestine below, with cramping colicky pains. The parasites eventually passed from the bowel wall into the lumen and became adult. Bacterial invasion through the points of exit complicated the condition.

With regard to Mr. Male's cases, were these congestion of the bowel and not really inflammation? It was during

*Paper, by C. W. Ottaway, M.R.C.V.S., and Myra L. Bingham, M.R.C.V.S., presented to the Central Veterinary Society (Division N.V.M.A.) at Reading, February 6th, 1941, and published in *The Veterinary Record* of May 17th, 1941. (**53**. 275-282.)

the stage of congestion that early acute symptoms of colic occurred.

Concerning *Strongylus edentatus*, they did not appear to have been found in the aneurysm. He had observed and Dr. Oldham had pointed out that there was no *Strongylus equinus* found in any of the recorded cases: there was no parasite found in the aneurysms other than the *Strongylus vulgaris*. *Strongylus edentatus* was often found in the scrotum at the time of castration. He was interested to note their occurrence in the subperitoneal tissues.

With regard to the diagnosis of the condition by blood examination, he and others had done this years ago, and eosinophilia was found. It did not help much in diagnosis, as it was also present with other worms, and the method was dropped. Small numbers of parasites could be responsible for trouble as well as large numbers, and faecal egg counts did not appear greatly to assist.

As regards anaemia, another aspect must be considered. There might be an intoxication. It was long ago suggested that a toxin was produced by *Trichonema* which caused haemolysis with consequent anaemia.

Concerning arteritis, what happened was that larvae, having arrived at the *vaso vasorum*, produced first an arteritis and then thrombosis. This was followed by dilatation of the vessel and aneurysm. In old animals the vessel wall might become very thick, and cause no trouble. Therefore, aneurysm might be met with in old horses with no colic resulting, although they might have had colic at some previous time, possibly as foals or yearlings.

Professor Wooldridge was not quite in agreement with Dr. Oldham when he said that the red colour of the *Trichonema* was due to ingested blood. These worms were not blood suckers, and the redness was the natural colour of many of the worms.

Mr. E. G. White observed that the important question of pathogenesis was still undecided. One view was that the larvae attacked the mesenteric artery from within its lumen: early lesions, consisting of larvae embedded in thrombus without changes in the media or adventitia of the vessel, supported that view, as did the occurrence of an arteritis of the thoracic aorta due to strongyle larvae. It might be that the larvae passed through the liver and lungs and got into the systemic circulation, whence they went to their "predilection site" in the anterior mesenteric artery. In this connection, could Miss Bingham state the size of the larvae after penetration of the intestine? Were they small enough to pass through the liver and lung capillaries? A possible line of research would be the examination of strongyle larvae in the lumen of, and outside the vessel and noting whether the stage of development differed appreciably. In this way they might find out whether the parasites were going in or coming out.

Some workers had considered iliac thrombosis in the horse, causing intermittent typical symptoms of iliac thrombosis, to be due to strongyles, but a case recently investigated in detail by Innes and Whittick gave no support to this view. Did Mr. Ottaway find evidence of iliac thrombosis in any of the ponies?

Professor Wooldridge stated that an attack from the intima by parasites was the old theory, but he was not satisfied as to such a possibility.

Mr. G. P. Male said that no one had suggested that larvae went from the thrombus to the lungs: the suggestion was that some went direct to the lungs. In the cases to which he had referred he was quite sure that inflammation was present, and not just simple congestion. Numerous punctures of parasites were obvious and bacterial invasion had produced enteritis and death. Colic was a very wide term: acute abdominal pain was not a feature of worm infestation.

Professor Wooldridge stated that he did not fully agree with that conclusion. In early stages, thrombosis would cause acute colic with congestion, before the worms had reached the bowel wall. Later, colic might occur when the worms had passed down, and inflammation might be set up by bacterial invasion.

Mr. Male said he was thinking of a case where an animal had only been ill a few hours, and on *post-mortem* examination an acute inflammation was found.

Professor Wooldridge did not think that acute inflammation was likely to occur in that short space of time. Death might be due to intoxication, secondary to bacterial invasion.

Mr. J. Francis observed that some speakers had suggested that the effect of the larvae might be thrombus formation, and others that a parasitic aneurysm partially occluded the artery, and so impaired the blood supply to the intestine. In the cases observed by the authors, was the lumen of the vessel occluded in any way?

Mr. White said that an aneurysm was a dilatation of an artery filled with blood or thrombus. The actual lumen might be smaller or larger than that of the original vessel.

Mr. A. N. Worden asked to be allowed to make a point. There had been various somewhat vague references to the "nerve-pressure theory" of Olt and others, and Mr. Ottaway had just said that he was of the opinion that such pressure was probably of some consequence in the causation of the symptoms and lesions. A few years ago Mollman ("Zur Pathologie der sympathischen Bauch-ganglien des Pferdes—Ganglion coeliacum plus mesentericum anterius—zugleich ein Beitrag zur Pathogenese der Kolik" *Ztschr. Veterinärk*, 1932, **44**, 273-288, cited in *Vet. Bull., Weybridge*, 1933, **3**, 200-201) investigated the ganglia of some 60 cases of verminous aneurysm, and if he was able to remember his figures correctly, detected inflammatory changes in about 60 per cent. of them. Might he suggest that in their future studies, the present authors examine histologically the ganglia from their cases?

The Replies

In reply to the discussion, Mr. C. W. Ottaway remarked that he was very interested in the points that had been put forward by members. The paper was essentially a case record and no attempt had been made to discuss the subject as a whole. Consequently many points had arisen which had been dealt with by members of the audience: this was all to the good, as the main object of the paper was to create a discussion and gain information—they (the essayists) had learnt quite a deal. He would attempt to answer specific questions put to him.

In reply to Mr. White, no attacks of colic had been noticed in any of these cases. He was very glad to hear Mr. Male's comments and agreed with the majority of his statements. He was also glad that he concurred about the enormous number of parasites that could be found. *S. vulgaris* larvae had never been found in the lung. One larva had been found in the liver, but, unfortunately, it was decapitated in making the section, and diagnosis was thus impossible.

He could not say anything about fatal cases, as in these ponies death was due to chloral hydrate poisoning followed by "bleeding out." He did not suggest that pressure on nerves in animals affected with aneurysm was the cause of death, but merely that it caused paralysis of the hindquarters.

No attempt had been made to treat these ponies, as they were to be used for dissection: he hoped that perhaps arrangements could be made to treat some in the future. He doubted whether even Mr. Male would have been successful in these cases. One was so weak that it had to be carried from the box. As regards treating horses with simple aneurysm of the anterior mesenteric root, that did not necessarily arise, as they often showed no symptom of disease. When it occurred with clinical symptoms he imagined treatment would be quite straightforward.

In reply to Mr. Formston, he thought the cases were definitely aneurysms, but thrombosis and arteritis were also noticed around the actual lesions. He had been able to make several rectal examinations extending over

the course of a few weeks, but had not detected any change in the condition. Thrombosis was not complete and the vessels were always patent. Evidence at *post-mortem* examination did not suggest that the vessels had been occluded at any time and later became patent again.

Several members had mentioned iliac thrombosis; all he could say was that they found no connection between the two conditions.

In reply to Professor Wright, these ponies were about 12 to 13 hands. He thought he could feel the root of the anterior mesenteric artery in a horse of 15 or 16 hands. In these ponies the fingers were on the root when the arm was in the rectum as far as the elbow. Another point was that in larger animals the lumen of the bowel was such as to allow of more room for manipulation. He thought the emaciation was due to bowel lesions.

He considered the paralysis due, directly or indirectly, to pressure on the coeliaco-mesenteric and posterior mesenteric ganglia and the coeliac and pelvic plexuses. These were connected in many ways with the spinal nerves, *e.g.*, the rami communicantes. It was possible that this pressure fibrosis, and its effects, caused a general nervous disturbance. This could easily be transmitted to the spinal nerves, particularly of the lumbar region. He found it very difficult to distinguish the various types of nerve fibres just from dissection, but was satisfied that there was sufficient contact between the nerves for pressure on one system, and the changes to which it might give rise, to cause effect on another.

Professor Wooldridge's remarks were very interesting—he was always worth listening to. As regards the life history they only felt competent to discuss what they had seen—later they hoped to be able to say more. However, although larvae had not been found in the lung, there was no doubt to his mind that the normal pathway was *via* this route. It was the "wanderers" that settled in the root of the anterior mesenteric artery, and it seemed impossible that they could migrate from this spot. Professor Wooldridge mentioned obstructive colic as due to parasitic embolism. He would repeat that they found no evidence of collateral blood supply or embolism, and only in one case obstruction of the lumen. He (Mr. Ottaway) believed that colic was not due to restriction of the blood flow as a result of the aneurysm, but that it arose from the result of pressure on the vago-sympathetic supply to the intestine.

He was interested to hear that differential blood counts had been used before as an aid to diagnosis: he hoped that more work would be done in this field. The difficulty was to ascertain what was the normal eosinophil count in horses, as parasites were usually present in experimental animals.

In reply to Mr. Worden, they had every intention of making histological examinations in the future; meanwhile they had noticed definite macroscopic changes.

Answering Mr. Francis, they had observed occlusion of the vessels in one case only. The effect was indirectly due to aneurysm, *via* the nerve ganglia, rather than to obstructed blood flow.

Miss Bingham said that she was interested in Mr. White's suggestions as to how the larvae entered the aneurysm. The answer rather depended upon which theory of the migration route one accepted. For example, if one accepted Olt's theory that the larvae were erratic and found their way into the anterior mesenteric artery, having traversed the mesentery, they must obviously enter the artery from the outside.

The infective larvae were very roughly 0·5 to 1 mm. in length. She did not know the actual size of the stages intermediate between these and larvae found in the aneurysm. In the latter situation they did vary enormously in size and many had moulted to adults in the aneurysms.

Replying to Prof. Wright, there was evidence of anaemia in some of the blood films, but in the majority of cases the most striking feature was the number of polymorphs, indicating some toxaemia, which might well result from the lesions set up by *S. edentatus* larvae under the peritoneum. In the last film that she examined the average number of polymorphs found was about 85 per cent.

In reply to Professor Wooldridge, *S. edentatus* were not found in any of the aneurysms. They were frequently found in the peritoneal cavity. No comment was made on this as it had been included in Table III, under No. 7. She did not believe that *S. vulgaris* larvae, which were found in the thrombus material in an aneurysm, ever reached the intestine again. She had purposely withheld any final opinion as to the *normal* route of migration.

ABSTRACT

[INOCULATION AND IMMUNITY EXPERIMENTS ON CALVES WITH THE VOLE STRAIN OF ACID-FAST BACILLUS. Griffith, A. Stanley, Dalling, T., and Pagel, W. (1940.) *J. Hyg.*, Camb. **40**. 673-680.]

In the October 12th, 1940, issue of *The Veterinary Record* (**52**. 41. 734) an abstract was published of a paper by A. W. Wells and W. S. Brooke (*Brit. J. exp. Path.* 1940. **21**. 104) which reported experiments on guinea-pigs providing evidence that the acid-fast bacillus recoverable from field voles evokes a degree of protection against infection with the bovine type of tubercle bacillus "which apparently is far greater than has been recorded by other means," including B C G vaccination. In the same issue a preliminary note by Stanley Griffith and Dalling was reproduced reporting that parallel experiments upon cattle at Cambridge had also given promise of success, the full report having meanwhile been submitted for publication in the journal in which the article under review has come to the notice of the *Record*.

Their experiments on ten guinea-pigs which were vaccinated subcutaneously each with 10 mg. of culture of two vole strains, in nine injections over a period of eight weeks, and then in four weeks injected subcutaneously with 0·001 mg. of virulent bovine bacilli, proved that the effect of the vaccine in these conditions was simply to delay the development of tuberculosis. As compared with five unvaccinated controls, which died of severe generalised tuberculosis in from 67 to 111 days after the test inoculation, the vaccinated guinea-pigs died in from 109 to 225 days, showing severe tuberculosis, typical of infection with virulent bovine bacilli.

In a second experiment, eight guinea-pigs were each vaccinated subcutaneously with 12 mg. of culture of the vole bacillus, in five injections over a period of eight weeks, and then on the day after the last injection they were tested by subcutaneous inoculation with 0·01 mg. of the bovine strain (No. 34). Four unvaccinated controls died in from 51 to 93 days of severe generalised tuberculosis, while six of the vaccinated guinea-pigs (two having died of accidental causes), killed to compare their resistance in 94 and 95 days, were found to be more resistant. One showed moderate generalised tuberculosis and four slight generalised disease, while in one the disease was limited to the site of inoculation and the inguinal and iliac glands on the same side. [The interval which was allowed to elapse between vaccination and the test inoculations seems to the abstractor to have been very short, and a higher degree of immunity might have been obtained if it had been extended to three months.]

Having found that the vole bacillus is not virulent for guinea-pigs, in so far as the effects observed were limited to those seen after injection with B C G, and the resistance of the injected guinea-pigs was raised against infection with virulent bovine bacilli, experiments were then carried out to test the pathogenicity and immunising value of the strain for calves.

One calf (No. 2), injected intravenously with 0·01 and 2·0 mg. at an interval of 116 days, died eight and a half days after the second injection, the result of an allergic reaction, with consolidation of the lungs. Another calf (No. 4), likewise injected intravenously with 0·05 mg. of a vole strain, died of non-specific pulmonary and intestinal disease 19 days after injection. Another calf (No. 13), injected intravenously with 10 mg. of the vole strain, showed distinct clinical signs of illness for ten days and was not well for about three weeks, breathing a little faster than normal, its appetite however remaining good. It was killed for examination 44 days after injection, and on the whole the changes in its carcase were very slight. Apart from necrotic areas which were not characteristic there were typical tubercles in various organs, but the content of the lesions in acid-fast bacilli was very low. Another calf (No. 12) was inoculated intramuscularly with 80 mg. of the vole strain. A swelling was seen at the site of inoculation which measured on the 14th day 14 × 7 cm. with some enlargement of the prescapular gland, and which then gradually diminished in size. When killed 89 days after inoculation the visible lesions were limited to the seat of injection and the nearest prescapular and prepectoral glands. Acid-fast bacilli were very numerous in the local pus and moderately numerous in the prescapular gland, but only a few of these were found to be alive on culture test.

The authors' conclusion from their detailed examination of the above calves is that the vole strain is able to excite in the calf a chronic tuberculous reaction, which wanes leaving few traces. No caseation can be observed in the lesions; a scanty necrosis is seen in some places. The longest period after inoculation that the bacillus was recovered from the tissues was 89 days, but this was obviously not the extreme limit. The vole bacillus, it is recalled, elicits typical tubercles also in guinea-pigs, rabbits, and hamsters, but not in voles.

Immunity Experiments on Calves

Nine calves, varying widely in age, were vaccinated in various ways. Four were vaccinated once: three by intravenous inoculation, at doses of 3, 5 and 10 mg. respectively, and one by subcutaneous inoculation, at a dose of 75 mg.; the intervals between the vaccinations and resistance tests being 65, 65, 166 and 175 days respectively. Five calves were vaccinated twice: two of these each received two intravenous injections, of 1 and 3 mg., and 0·1 and 1 mg., respectively, at 97 days' interval between the two doses; one received an intravenous injection of 2 mg. followed by a subcutaneous injection of 85 mg. after an interval of 146 days; and two received two subcutaneous injections of 20 and 50 mg., and 50 and 75 mg., at intervals of 94 and 111 days respectively.

The resistance to tuberculosis of the nine vaccinated calves was tested, at intervals ranging from 21 to 175 days after the last injection, by oral administration of 7·5 mg. of virulent bovine tubercle bacilli; the calves were killed for examination 208 to 223 days after the resistance tests.

Two unvaccinated control calves were infected with the above test dose. One of those killed 208 days after feeding, showed widespread caseating and slightly calcareous glandular lesions, two large foci in the lungs, several subcapsular lesions in the liver, some peritonitis, and twelve lesions on the diaphragm. The second, killed 223 days after feeding, showed somewhat less widespread generalised disease.

Of the vaccinated calves, five showed trivial lesions in the glands of the alimentary tract. In two of these calves, both of which had been vaccinated twice, there was, in each, one focus only, one in a mesenteric and one in a retropharyngeal gland. In three, namely, one vaccinated once intravenously and two twice subcutaneously, the mesenteric glands contained a few small lesions, and in one a caseous tubercle was found in a colic gland. The remaining four calves showed no macroscopic tuberculous lesions in any gland or organ. Three of those calves had had single injections of the vole strain, namely, two intravenously and one subcutaneously. The fourth calf had had two injections, namely, one intravenous and one subcutaneous, the resistance test being made only three weeks after the latter injection.

Sensitiveness to tuberculin following injection of the vole strain appeared to develop very early.

Emulsions of the lymphatic glands of the vaccinated calves were inoculated into guinea-pigs. As a result it was found that living bovine tubercle were not present in emulsions of mesenteric or thoracic glands of two of the four no-lesion calves. They were demonstrated in the mesenteric glands but not in a bronchial gland of a third. The pooled glands of the fourth caused generalised tuberculosis in two guinea-pigs.

Living bovine bacilli were very sparse in the thoracic glands of two of the calves with trivial lesions in the head or mesenteric glands and were not present in a bronchial gland of a calf which showed a few foci in the mesenteric glands. Living bovine bacilli were also present in the lymphatic glands of one calf, but which were the glands that contained them could not be stated as the glands were pooled before injection. The mesenteric glands only of the remaining calf were tested and proved infective.

As no lesions were found after single vaccinations in three of the calves (two vaccinated intravenously and one subcutaneously), and after two vaccinations in one calf only, there seemed to be no advantage in giving more than one dose of the vole bacilli. The intravenous method, however, seemed preferable to the subcutaneous method, because the former did not produce an unsightly local lesion. The intervals between the single vaccinations and the resistance tests in these no-lesion cases ranged from two to six months.

The authors conclude that the results obtained with the vole strain of acid-fast bacillus were "unexpectedly good and better than those which followed the use of B C G as a vaccine." They think, however, that the immunising power of the vole strain against tuberculous infection in the calf should be further tested, and suggest using one form of injection only for the vaccination, namely, the intravenous one, and one dose, for example, 5 mg., and testing the resistance of the calves after six months.

J. T. E.

IN PARLIAMENT

The following are among the questions and answers recently recorded in the House of Commons:—

Poultry Stocks (Inspection)

Mr. De la Bere asked the Minister of Agriculture whether he will now consider issuing a report setting out the conclusions the Ministry have arrived at, after inspection of poultry flocks by breeders, with a view to guidance for the future in improving the health of poultry flocks, as a result of information obtained?

Mr. Hudson: The only country-wide inspection of poultry flocks recently carried out at the instance of the Ministry is that made by panels appointed at my request by County War Agricultural Executive Committees. The inspection was made with a view to the selection of sound foundation pure-bred poultry breeding stocks which could be recommended for preference in the supply of concentrated feeding-stuffs. When inspecting stocks for this purpose the panels (which in each case include a veterinary surgeon) specially take into consideration the health of the birds and may require special health tests to be carried out. The information obtained in the course of the inspections is not such as to necessitate any modification of the advice already given in the bulletin and leaflets published by the Ministry, copies of which I am sending to my hon. Friend.

. . . . . .

Riding Horses (Rations)

Mr. R. Morgan asked the Parliamentary Secretary to the Ministry of Food whether he will consider allowing a ration of feeding-stuffs for riding and carriage horses until such time as the grass is fit for their consumption without deleterious results?

Major Lloyd George: I regret that owing to the shortage of animal feeding-stuffs it is not possible to adopt my hon. Friend's suggestion.

. . . . . .

Racehorses (Oat Ration)

Mr. Stokes asked the Parliamentary Secretary to the Ministry of Food whether in view of the fact that the 2,500 horses in training for racing consume oats sufficient to keep 7,500 cows or 1,000,000 hens, and as cattle and poultry are being slaughtered for want of food, he will halve the racehorses' ration of oats? Does the Parliamentary Secretary consider it reasonable to ask people to slaughter their livestock while racehorses are still allowed to live?

Major Lloyd George: As the hon. Gentleman knows, there has been a great reduction of the number of horses in training. The decision as to whether training should continue is not a matter for me.

Mr. Stokes: Can the Parliamentary Secretary tell me the number of horses in training?

Major Lloyd George: About 2,300. The hon. Gentleman's figures are wrong as to the number of hens.

Mr. de Rothschild: Is it not a fact that frequent race meetings are held at the present time in Germany, Italy, Belgium, and France, and that one cannot feed hens on the same food as horses, because it would be just as unprofitable as to feed human beings on the same food as fly catchers?

Mr. Stokes: If my figures for the number of hens are incorrect, does the Parliamentary Secretary's calculation show the figure to be higher or less than 1,000,000?

Major Lloyd George: The actual figure is less than one-tenth.

. . . . . .

Trained Dogs (Rations)

Mr. R. Morgan asked the Parliamentary Secretary to the Ministry of Food whether he will consider granting rations for the hundred or so trained dogs of blind men?

Major Lloyd George: I shall be happy to consider my hon. Friend's suggestion if he will be good enough to let me have particulars of what he has in mind.

War Damage Act

Sir I. Albery asked the Chancellor of the Exchequer, in cases where war damage has already been suffered, whether the insurance premiums, both for house property and chattels, will be debited against the claim, or whether the claimant has to provide premiums in cash in addition to the financial loss, direct and indirect, already incurred?

The Financial Secretary to the Treasury (Captain Crookshank): I will deal separately with the contribution in respect of house property and the insurance premium in respect of chattels. Under Section 33 of the War Damage Act, 1941, any instalment of contribution falling due in respect of a house which has suffered war damage will be allowed to stand over so long as the Inland Revenue are satisfied that the house is unfit for occupation. A claim to defer payment on this ground should be made when the notice of assessment is received. In cases where a "cost of works payment" is appropriate the instalment will not become payable until the house has been made fit for occupation. If the Inland Revenue are notified by the War Damage Commission that a "value payment" and not a "cost of works payment" is likely to be made, collection of instalments of contribution will be suspended unless and until the notice is revoked, and if a value payment is eventually made, the amount of that payment will be reduced by so much of the instalments as has not been paid. With regard to the insurance schemes under Part II of the Act, I understand that where war damage has been sustained before April 17th, 1941 (in the case of the business scheme), and before May 1st, 1941 (in the case of the private chattels scheme), the dates of coming into operation of these schemes, an amount in respect of premium will be deductible from the compensation allowance.

. . . . . .

Medicine Stamp Duties

Sir I. Fraser asked the Chancellor of the Exchequer in what form the legislation required to repeal the medicine stamp duties will be introduced?

Sir K. Wood: It has been decided that the separate Bill referred to in my Budget speech will contain the repeal of the medicine stamp duties as well as the provisions consequential upon that repeal. The Bill will be presented to Parliament shortly.

. . . . . .

Alien Doctors, Great Britain

Colonel A. Evans asked the Minister of Health how many friendly alien and Allied alien doctors with special qualifications are still unemployed; how many Czechs with medical degrees in their own country are now studying for English degrees; whether this necessity must now be imposed on qualified men, particularly since special scholarships had to be granted to enable them to study; whether there is a surplus of army doctors with the Czech Army; and whether, in view of the shortage of doctors, particularly in reception areas, the fact that alien doctors are barred from private practice, and the appeal that has been made to the United States of America for 1,000 doctors to serve with the British Red Cross, he will take steps immediately to absorb all unemployed doctors, irrespective of nationality, and permit alien doctors already qualified in their own country to practise without taking English degrees?

Miss Horsbrugh: I am not in possession of the information requested in the first, second and fourth parts of the Question. As to the third and fifth parts, the Medical Practitioners (Temporary Registration) Order, 1941, provides a wide field of employment for American and Allied alien doctors and refugee doctors of enemy nationality in hospitals and other approved institutions without the necessity of obtaining British medical qualifications, and their absorption into this service is proceeding steadily. I am advised that linguistic and other difficulties make it inadvisable to allow these doctors to engage in domiciliary practice.

Colonel Evans: In view of the grave shortage of doctors in this country at the present time, will the hon. Lady ensure that the services of all friendly Allied and alien doctors, who register themselves and their qualifications at the Ministry of Health, will be available in time of need?

Miss Horsbrugh: Yes, Sir.

Sir H. Morris-Jones: Is the hon. Lady aware that there is almost a complete breakdown at the present moment regarding the employment of friendly Allied and alien doctors in this country? Is she aware that there are 700 such doctors in this country, and that we are asking for 1,000 doctors from the United States? The whole thing is wrong.

Mr. G. Strauss: May we take it that these 700 doctors will be absorbed in medical work in this country if they register and speak the language?

Miss Horsbrugh: I could not say without notice what is the number of alien doctors in this country, but I can assure hon. Members that all will be used in hostels and institutions, and that the general scheme for reorganisation of medical practitioners is going on.

. . . . .

Agriculture: Advisory Leaflets

Mr. T. Smith asked the Minister of Agriculture the extent of the demands for the various advisory leaflets for farmers and allotment-holders issued by his Department?

The Minister of Agriculture (Mr. R. S. Hudson): There has been a marked increase this year in the demands for leaflets in the "Growmore" series for farmers and in the "Dig for Victory" series for allotment-holders and gardeners, and steps have been taken to ensure that these leaflets reach those who will derive benefit from them. From January 1st to April 30th this year, the demands for all "Growmore" leaflets totalled over 1,250,000, compared with about 400,000 for the same period in 1940. Nearly 250,000 leaflets on "The Early Bite," "Nitrogen—The Way to High Yields," and "Kale for Winter Feed" have been issued to date this year, compared with about 30,000 during the whole of last year. During March last, the Postmaster-General, at my request, arranged for a house-to-house distribution in rural areas of the principal "Dig for Victory" leaflet—"Vegetable Production in Private Gardens." Including demands from the urban areas, 5,000,000 copies of this leaflet have been distributed in the past two months, together with over 600,000 copies of a coloured cropping chart showing how to plan the production of vegetables for winter as well as summer. Over 1,000,000 copies of the various advisory leaflets in the "Dig for Victory" series have also been issued to date.

Mr. Smith: Is my right hon. Friend satisfied that the advice given in these leaflets is generally followed by farmers and allotment-holders?

Mr. Hudson: As a result of the propaganda campaign on the wireless and in the Press, more attention is being paid to, and more use is being made of, the advice made available for farmers and allotment-holders.

. . . . .

Horseflesh

Mr. Sorensen asked the Parliamentary Secretary to the Ministry of Food whether he has any information respecting the sale of horseflesh for human consumption; and what restrictions exist for the prevention, control or restriction of the sale of horseflesh for this purpose?

Major Lloyd George: I have no information which suggests that there is any appreciable demand for horseflesh for human consumption, the sale of which is covered by the Food and Drugs Act, 1938. Apart from the general provisions of the Food and Drugs Act, 1938, for the protection of purchasers, special provisions to be observed in connection with the sale of horseflesh for human consumption are contained in Section 38 of that Act, of which I am sending my hon. Friend a summary.

Mr. Sorensen: Is the Parliamentary Secretary aware that statements have been made that a good deal of horseflesh is now being consumed, in disguise with other foodstuffs, and will he not insist that wherever foodstuffs do contain horseflesh, this fact is stated to the public, together with the amount of the percentage of horseflesh?

Major Lloyd George: I think the hon. Gentleman will see that that is contained in Section 38 of the Act. There is no objection to anyone eating horseflesh if he wants to do so, but he must be aware of it. The Act makes that perfectly clear.

Sir Ralph Glyn: Would my hon. and gallant Friend, in consultation with the Ministry of Agriculture, take steps to see that the present method of slaughtering horses for human consumption is supervised and inquired into?

Major Lloyd George: Yes, Sir.

Mr. Benson: Does not the Parliamentary Secretary think that if we eat horseflesh without knowing it, we shall enjoy it more?

. . . . .

Grassland Ploughing

Mr. Groves asked the Minister of Agriculture, how many farmers have taken advantage of the Government's scheme of assistance of £2 per acre for ploughing; and whether he is satisfied with the response to the offer?

Mr. Hudson: About 200,000 payments have been made to date, but it would not be possible, without a good deal of detailed investigation, to state the number of farmers concerned. As to the last part of the question, I am well satisfied with the farmers' response.

. . . . .

Feeding-stuffs (Experiments)

Mr. Sorensen asked the Minister of Agriculture whether his expert advisers have reported on the advantages or disadvantages of the chemical conversion of wheat, barley and oat straw into straw pulp for feeding-stuff for cattle; and whether large quantities of this substance are likely to be made available in the future?

Mr. Hudson: Presumably the chemical treatment of straw with caustic soda is referred to. This process is now being experimentally operated on many farms throughout the country. Feeding trials are also being conducted under the auspices of the Ministry and the Agricultural Research Council. Reports of both the practical and scientific experiments are now coming in, and I hope shortly to be in a position to assess the extent to which this development might contribute to the provision of some additional feeding-stuffs.

Mr. Sorensen: Is this substance now being offered for sale, and has the Minister yet found out whether the substance has any deleterious effect on the cattle?

Mr. Hudson: The process is now being experimentally operated on many farms thoughout the country, and we expect to get the results shortly.

Mr. Sorensen: Is the substance on sale?

Mr. Hudson: There is no reason why it should not be on sale.

IDENTIFICATION OF SHEEP BY NOSEPRINTS

An infallible method of identifying Merino sheep by their noseprints has been tested in a South African research station. The method is similar to the identification of human beings by fingerprints. The problem of identifying Merino sheep has always been puzzling. There have been instances on record where the identity of certain valuable stud animals could not be legally established.

Dr. V. Bosman, Senior Wool Research Officer at the Onderstepoort Laboratories, Pretoria, has succeeded after four years' research. He took 2,000 prints from different sources, and it was found that no two sheep gave exactly the same noseprint. The prints proved that the size of the nose pattern might change, but the pattern itself remained the same,—*Farmer and Stock-breeder.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

May 28th.—Annual General Meeting of the Eastern Counties Division, N.V.M.A., at Norwich, 2.15 p.m.

May 30th.—Special Meeting of the North Wales Division, N.V.M.A., at Denbigh, 2 p.m.

June 5th.—Meeting of the Central Division, N.V.M.A., at the Conway Hall, Red Lion Square, W.C.1, 3 p.m.

June 9th.—D.V.S.M. Examination at Glasgow Veterinary College.

June 19th.—R.C.V.S. Committee Meetings, Royal Station Hotel, York.

June 20th.—R.C.V.S. Annual General Meeting, Royal Station Hotel, York, 12 noon.

June 20th.—R.C.V.S. Committee and Council Meetings, Royal Station Hotel, York.

June 20th.—Victoria Veterinary Benevolent Fund Annual General Meeting, Royal Station Hotel, York, 12.30 p.m.

June 26th.—R.C.V.S. Written Examination begins.

June 30th.—R.C.V.S. Oral and Practical Examination begins.

* * * * *

PERSONAL

Birth.—On May 14th, 1941, at The Cottage Hospital, St. Andrews, to Susan, wife of R. W. Bowman, B.Sc., M.R.C.V.S., a daughter.

. . . . .

Marriage.—Hussey—Teverson.—On May 10th, at the Congregational Church, Buckhurst Hill, Bryan Francis Vivian Hussey, second son of Mr. and Mrs. A. V. Hussey, of Aveley, to Ruth Teverson, M.R.C.V.S., only daughter of Mr. and Mrs. A. B. Teverson, of Buckhurst Hill.

. . . . .

Member's Son Awarded the D.F.C.—We learn with much pleasure of the award of the Distinguished Flying Cross to Flight-Lieutenant Peter Gerald Hugh Matthews, a native of Hoylake, who, in the words of the official record, "has displayed high qualities of leadership and exceptional tactical ability, and has destroyed at least four enemy 'planes."

Flight-Lieutenant Matthews was born in 1919 and was educated at Quarry Bank School and Liverpool College. He was commissioned in 1937 and became Flight-Lieutenant in June last.

His father, Mr. H. T. Matthews, F.R.C.V.S., a Hoylake man, was appointed Chief Veterinary Officer of Liverpool in 1936, and is now Superintending Inspector, Animal Health Division, Ministry of Agriculture and Fisheries.

* * * * * *

GENERAL OBITUARY

Captain Fergus MacCunn

The veterinary profession will learn with profound regret of the passing of Captain Fergus MacCunn, Chief Secretary of the Royal Society for the Prevention of Cruelty to Animals, who died on Sunday last at Malvern, following a long period of ill-health.

Capt. MacCunn brought to the fulfilment of his responsible duties a genial disposition, inexhaustible patience and marked ability. He became Chief Secretary on the retirement of Captain Fairholme, and throughout his long period of service with the Society, fostered and maintained the closest and friendliest collaboration with our profession. He was well known, not only for his devoted and efficient service to the R.S.P.C.A., but for his travels in many lands on behalf of the Animal Welfare Movement.

Colonel R. J. Stordy represented the President and Council of the National Veterinary Medical Association, also the President and Council of the R.S.P.C.A., at the interment, which took place at Malvern on Wednesday last.

Deep sympathy will be extended by the members of the profession to Captain MacCunn's widow, and to his son, who is now on active service with the Cameron Highlanders.

. . . . .

Sir D'Arcy Power

The announcement of the death of Sir D'Arcy Power, which took place at Northwood on Sunday last, at the age of 85 years, will be received with deep regret by members of the veterinary profession, for long before the close liaison with the sister profession which was inaugurated by the formation of the Comparative Section of the Royal Society of Medicine, D'Arcy Power was well known amongst us for his views as to the value of such collaboration—a major interest of his, of which he gave frequent and welcome evidence by his presence on some of our great "social occasions," such as the Annual Dinner of the Royal College of Veterinary Surgeons.

Throughout a long and busy career as a surgeon he was exceptionally active in literary and historical pursuits. He began as an author in 1877, and when a collection of those of his learned writings which had become unaccessible was made in 1931 to celebrate his seventy-fifth birthday, it was stated that he had written well over 600 items. In 1893 he contributed the first of his nearly 200 biographies to the Dictionary of National Biography, and he wrote a great number of articles on "epoch-making books" and bygone surgeons for the *British Journal of Surgery*. He was a leading authority on William Harvey, the discoverer of the circulation of the blood, and on John Hunter, greatest of British surgeons.

"Most of D'Arcy Power's literary energies," states *The Times*, "were devoted to the history of hospitals and of the craft of surgery in this country, but he was also a skilled bibliographer, and all his writings had a scholarly distinction that raised them far above specialised antiquarian research. Among his more generally interesting productions were his contributions towards the biography of John Hunter, his treatment of the history of his own hospital of St. Bartholomew, and his explanation of why Samuel Pepys discontinued his diary. Pepys, he stated, suffered from a combination of states known technically as 'hypermetropia,' or farsight and astigmatism. D'Arcy Power even estimated the degree of error of refraction from which Pepys suffered and wrote a 'prescription for him.'"

In 1882 he was admitted M.R.C.S.Eng. and elected F.R.C.S. in 1883. He was Hunterian Professor of Surgery and Pathology, 1896-97, and was appointed a member of the committee of the Royal College of Physicians to revise the Nomenclature of Diseases in 1912. He was Bradshaw Lecturer for 1919, Vicary Lecturer for 1920, Vice-President in 1921 and 1922, and Hunterian Orator, 1925. He was intimately connected with a large number of hospitals, and he held many offices in the British Medical Association, the Royal Medical and Chirurgical Society, the Pathological Society, the Harveian Society of London, the Medical Society of London, the Royal Society of Medicine, the British Orthopaedic Society, the Medical Research Club, and the Society for the Study of Disease in Children. D'Arcy Power was corresponding member of numerous learned societies, and was an examiner for several universities. For many years he was visitor for King Edward's Hospital Fund for London. During the last war he served as Lieutenant-Colonel, R.A.M.C. (T.), and was created K.B.E. in 1919. Sir D'Arcy Power was a distinguished Freemason.

R.C.V.S. ANIMAL MANAGEMENT EXAMINATION

(*May*, 1941)

List of Successful Candidates

London

Ali, S. M.	Grater, G. S. (credit).
Aspinall, K. W.	Harvey, Denis
Bateman, H. N.	Holford, S. E.
Bowditch, E. B.	Jardine, R. A.
Burke, N. F. S.	Knowles, J. F.
Callear, J. F. F.	Nandi, S. N.
Dalton, P. J.	Pettifer, John
Daniel, W. J.	Stephenson, Miss D.
Das, M. S.	Underwood, D. B.
Fawbert, Miss Doreen	Warde, J. D. (credit)
Fry, F. C.	Williams, E. I.
Goulstone, R.	Wood, J. G. P. (credit)

(*To be continued*)

* * * * *

THE HUMAN FOOD PRODUCTION CYCLE

The policy of the War Cabinet has been a reduction in the number of livestock. This decision is not so much the enunciation of a policy as a warning. The War Cabinet would, no doubt, wish that we should produce much more meat and milk than formerly, but its practical directions are that we cannot obtain the millions of tons of imported feeding-stuffs that were formerly available. Shipping space must be diverted to other uses. Livestock products, whether from milk or meat, must come more and more from our own soil. And even in normal times much of the productiveness of our soil depends on the flock. Much more important are sheep in these times when the farmer has not his normal facilities.

The edict that grass flocks must be decreased is again no more than a warning. They must decrease with the diminished grassland. If, however, arable flocks decrease, so must the fertility of much of our arable land. This will affect the production of the cereals that go directly to household tables. Kale, roots and other fodder crops for sheep are not, in the long run, diverting land from the production of human food. They are part of the cycle that increases the production of human food.—*Farmer and Stock-breeder.*

* * * * *

LEGAL NOTES

Slaughter of Casualty: Failure of Owner to Report.—The slaughter and disposal of a casualty heifer, contrary to conditions laid down under the Defence Regulations, was the subject of charges recently preferred against a farmer and a butcher at Stafford County Police Court.

The farmer, George William Gray, was charged with failing to give notice of the slaughter of an animal within 48 hours to the district chairman of auctioneers; and John Charles Shropshire was charged with having disposed of livestock, contrary to the Defence Regulations.

For the prosecution, it was accepted that the heifer was a casualty, and that slaughter was necessary. Against Shropshire it was alleged that he did not treat the meat in a manner that would prevent it being disposed of for consumption by the public. Both defendants could have been charged with the illegal sale of the beast, but the Ministry did not wish to press the case unduly.

Gray stated that a veterinary surgeon ordered slaughter for humane reasons. He did not know that he himself had to report the matter, and he was confident that most farmers in the county were unaware of the requirements in that respect.

Shropshire stated that he had intended taking the carcase to the depot at Newport, but it was badly bruised, and it was boiled for the pigs.

Defendants were each fined £5, with £1 16s. 9d. costs.

* * * * *

RED CROSS AGRICULTURE FUND

A cheque for £50,000, bringing the total to £511,500, was passed to the Duke of Gloucester on May 9th as the latest contribution by the Red Cross Agriculture Fund to the Duke's appeal on behalf of the Red Cross and St. John Fund. This amount does not include the result of the Scottish appeal.

* * * * *

FOOT-AND-MOUTH DISEASE IN EIRE

In the Dail on April 23rd Dr. Ryan said that the number of animals slaughtered on account of foot-and-mouth disease up to April 20th was as follows:—

Cattle	10,073
Sheep	3,401
Goats	89
Swine	974

The total cost to the Exchequer was estimated to be £229,299, made up as follows:—

Compensation actually paid	£144,424
Compensation awarded, but not yet paid ...	56,021
Payments to temporary lay assistants (Local Security Force)	23,136
Payments to temporary officials	1,256
Travelling and miscellaneous	4,462

Dr. Ryan, in reply to Mr. E. O'Neill, said that the measures taken to control the disease had been effective where the Department had had the full co-operation of stock-owners. Improvements in methods of control, which experience had shown to be necessary and useful, were being adopted.

An unsatisfactory feature of the present position was the occurrence of disease at centres in the country some miles apart from previous disease centres. The disease was under control at these new centres, and if stock-owners in the areas would refrain from visiting other premises and not allow their neighbours or others to come in contact with their animals or premises, and would give the Department's officials the fullest information they possessed, no widespread extension from these centres was anticipated.

The Dublin area, with its dense stock of dairy cattle, was regarded as the most dangerous centre, but there were some signs of improvement recently in this area. While the position generally must be regarded as serious, it does not threaten to destroy the whole livestock industry.

. . . . .

Foot-and-mouth disease was confirmed on Saturday among cattle at Gilling, near Richmond, Yorkshire.

● ● ● ● ●

ROYAL DUBLIN SOCIETY

The Royal Dublin Society has just issued a little brochure of 16 pages, placing on record the achievements of the Society since its formation in 1731 at a meeting held in the rooms of the Philosophical Society, Trinity College. It is a story of over two centuries of splendid work, and is well worth the telling. Many industries—notably agriculture in all its branches, with the great shows at Balls Bridge—have benefited vastly from its assistance, and it may come as a surprise to many to note the number of projects which had their origin in the R.D.S. It had only been in existence for two years when "the Society's Garden" was established. In 1795 a site of 16 acres was obtained at Glasnevin. This was added to at intervals until, in the year 1878, when the Society's connection with the Gardens ceased, the grounds comprised approximately 45 acres and the Botanic Gardens were of world renown. Among institutions which owe their foundation to the "Royal Dublin" are the Veterinary College, the National Library of Ireland, the National Museum and the National Art Gallery, and the College of Science (now part of University College).—*Belfast News Letter.*

* * * * *

Lord Woolton, Minister of Food, has announced that there is no likelihood of a shortage of milk during the next six months, but there is something approaching a certainty that there will be a shortage during the winter.

HILL COW SUBSIDY FOR SCOTLAND

A subsidy for cows on hill grazings is announced by the Department of Agriculture for Scotland. The scheme, which is still in preparation by the Department, provides that, in approved cases, a small yearly subsidy for each breeding cow maintained over a minimum period of three years on hill grazings for at least eight months each year will be made. Breeding cows of the Highland and Galloway breeds or crosses of those breeds with a Shorthorn bull will be eligible for assistance.

* * * * *

MINISTRY OF AGRICULTURE NEWS SERVICE

Reducing Dairy Herds.—The Minister of Agriculture [as recorded in these columns] recently informed the House of Commons that the percentage reduction contemplated in dairy herds will vary according to the character of the herd. Mr. Hudson went on to say that in some cases no reduction will be needed, but where cows are kept intensively and mainly on purchased feeding-stuffs, or the herd includes a number of animals of an inferior type or suffering from disease, with low milk yields, a certain reduction in numbers would be desirable.

Milk from Home-grown Foods: One Way to Replace Oil Cakes.—Scarcity of imported foods is reviving interest in systems of feeding practised in days before oil cakes and the like were available. An old New Zealand dairy farmer gives the following description of his methods: A pit, sufficiently large to hold two good feeds for each cow, is made close to the milking shed and lined with wood, brick or concrete. This is filled every day with alternate 3-inch layers of chaffed hay and pulped roots. After filling, sufficient boiling water to soak through the mass is poured on and the surface covered immediately with a good thickness of sacks to keep in the heat and steam. Half the steamed mixture is fed to the cows on the following morning, the sacks then being replaced to keep the material warm for the afternoon feed. In addition, the cows receive two feeds of oat sheaves, cut shortly before ripeness and containing the whole of the grain, and an extra allowance of hay after the afternoon feed. Each animal is given as much of the steamed mixture and the oat sheaves as she can readily clean up. The steaming process is said to remove all danger of producing "turnip taint" in the milk. Such feeding in late and upland districts would be ample for cows yielding only moderate amounts of milk, but for higher yielders the addition of some other food rich in protein would be necessary.

More Linseed Wanted: Useful Crop for May Sowing on Newly-ploughed Land.—Supplies of imported oilcakes are short and the Government have advised farmers to grow a larger acreage of linseed for seed in Great Britain this season. Linseed is suitable for sowing as late as May on newly-ploughed grassland and many farmers should be able to plough up a few more acres to sow with this crop. Linseed is a useful late crop to sow on newly-ploughed land because it is comparatively immune to damage by wireworm and rabbits.

As in the past season there will be no restriction on the use or sale of his linseed by the farmer, who may either sell it in the open market for veterinary, medical or other purposes or may sell it to a seed-crushing mill on behalf of the Ministry of Food at a price of £17 per ton, bags included, delivered to the nearest oilseed mill. Owing to the shortage of oilcakes it will not be possible to give the grower the option to purchase a specified quantity of linseed cake. All cake made from home-grown linseed will have to go into the general pool.

Soya Beans: No Suitable Variety yet found for Britain.—The soya bean is one of the most remarkable plants in the world. Besides doing everything one would expect of a bean, it produces oil and even milk. It is of high feeding value, and it is said to have saved the population of Vienna from starvation in the last war.

This has led many people to consider its possibilities in this country, particularly in war-time. Experiments in growing it have been carried on at Rothamsted since 1934 by Professor W. Southworth, who produced one of the most successful varieties when he was in Manitoba. Dr. H. M. Mann, an expert on the crops of warm climates, has been carrying out similar research at Woburn. The result of the experiments so far is not, unfortunately, encouraging.

The soya bean is more at home in warmer, drier and more certain climates. These experiments have shown that three conditions are necessary for successful cultivation, namely: (1) absence of late frosts in spring; (2) warm summers; (3) dry autumns. In most parts of the country these conditions cannot be assured and consequently yields have not usually exceeded 6 or 7 cwt. per acre of clean beans. This is less than the yields obtainable from ordinary field beans and from linseed, in many respects comparable crops for animal feeding. The search for more productive varieties is continuing, but it is bound to be slow. It has been suggested that a warm night temperature is even more important than a high day temperature. It is hoped to test this point by experiments in the south-west.

Dung is the Good Farmer's Standby.—With short supplies of potash fertilisers and a heavy demand for phosphates, it is more than ever important that the fullest possible use should be made of farmyard manure. The fact that there will be fewer livestock adds to the necessity to make the most of the dung that is available. Dung has been the standby of arable farmers throughout the ages and chemical fertilisers are a supplement and not a substitute. They cannot replace the humus, which represents the great value of farmyard manure over and above the fertilising elements it contains. This humus is a great stabiliser of yield. The soil well provided with humus always comes off best when weather conditions are difficult. Dung raises the farm to a higher standard of fertility and makes a solid foundation for the action of chemical fertilisers that may be required.

A fattening bullock or cow kept under cover produces about 1 ton per month; younger stock, of course, less. With 50 head of mixed stock enough dung should be produced during winter for a dressing 10 to 12 tons per acre for 15 to 20 acres. Horse dung ferments and acts quickly; cattle and pig manure is slower acting and more durable. The dung of dairy cows and growing stores tends to be poorer than that of fattening bullocks because more of the elements of plant food go to form muscle, bone and milk. Rotten dung is richer and more active than fresh material, but rotting and storing inevitably cause loss. Under any ordinary conditions of storage, farmyard manure loses nitrogen, and if moisture is allowed to drain from the heaps potash is also lost. If the manure becomes dry, nitrogen is also lost by fermentation.

* * * * *

FEEDING-STUFFS FOR DAIRY FARMERS KEEPING COWS INTENSIVELY

A joint announcement by the Ministry of Agriculture, Department of Agriculture for Scotland and Ministry of Food, states: "The utmost economy in the use of concentrated feeding-stuffs will be necessary during the summer months, and issues under the rationing scheme are being restricted to the minimum. Special temporary arrangements have hitherto been made to provide feeding-stuffs additional to the normal ration for milk producers in certain areas who keep cows intensively, and who are largely dependent on purchased feeding-stuffs in summer as well as in winter. It will not be possible to continue these arrangements: all milk producers in the areas concerned will now be dealt with on a uniform basis, save only in respect of allowances for high milk yields.

Milk producers who keep a large number of cows in

relation to the area of land they occupy, and are unable even in summer to provide from the produce of their farms more than a small proportion of the food necessary to maintain milk yields, are therefore advised to make the necessary adjustments for the conditions which will obtain during the summer months, and subsequently.

* * * * *

DILUTION OF COD LIVER OIL

It was with some consternation that the War Committee of the National Farmers' Union and Chamber of Agriculture for Scotland learned some time ago of the decision of the Government to sanction a dilution in the composition of cod liver oil. It was immediately represented through the Department of Agriculture for Scotland that any general falling off in the quality of supplies to the agricultural industry would be strongly deprecated, and the Department agreed to investigate the position.

The latest information received is to the effect that vitamin tests, under the auspices of the Ministry of Food, are still in progress, but that preliminary indications would appear to be that the diluted cod liver oil is satisfactory. The Ministry have undertaken to look into any specific complaints reported to them, where full details of the source of supply and the purpose for which the oil was used are given.—*Farming News.*

* * * * *

CONCERNING WHEY

To derive the maximum benefit from the heavy production of milk during the ensuing months, arrangements have been made to convert as large a proportion of milk as possible into those products which will keep and so be available to augment food supplies next winter. Cheese-making on an enlarged scale will be undertaken, and the resultant whey will be condensed or dried for ultimate use for human consumption or as calf food, to the full capacity of available plant. Surplus whey must be used for stock, and to facilitate this economic method of disposal, the following scheme has been approved, involving, in some instances, increased allowances of cereal feeding-stuffs for pigs.

. . . . . .

Similar in all respects to first-quality butter-milk, a new dairy product has been evolved from whey by research workers of the West of Scotland Agricultural College. Since bakers can no longer use milk or milk-powder this new product, which can be made commercially with existing equipment, should be of particular value at the present time. The handling of millions of gallons of whey at creameries may be revolutionised.—*Agricultural Press.*

* * * * *

BRUCELLA INFECTION

"The discovery of *Brucella melitensis* in the milk of some cows in a Midland herd, revealed by Mr. F. W. Duke in his short article in our issue of October 26th (p. 517), may cause some uneasiness, for, of the three known species of brucella, melitensis is by far the most dangerous to man," observed *The Lancet* later in the year. "Though somewhat locally distributed, *Br. abortus* is not uncommon in milch cows in Britain, and since most milk in this country is still unpasteurised infection of man by that organism must be frequent; yet though we have been on the look-out for human brucellosis for several years the number of cases recorded is small. The disease of man caused by *Br. abortus* is, however, very indefinite and doubtless many atypical cases occur in which their true nature is not suspected. Man is much more susceptible to *Br. melitensis*, proved by Bruce in 1887 to be the cause of what was then known as Malta or Mediterranean fever, a disease which was by no means uncommon until it was found to be spread by goat's milk and readily prevented either by avoiding goat's milk or by boiling it. So far as we know, *Br. melitensis* has never been found in goats in this country, and since cows are supposed not to harbour this species its discovery is surprising and unwelcome. The fact that no case of human Malta fever has been recorded in this country suggests that the passage of the organism through cows may reduce its virulence to man, but in the south-east of France there were numerous instances in which a cow became infected from neighbouring goats, excreted *Br. melitensis* in its milk and gave rise to cases of typical undulant fever in human beings. There is, of course, the possibility that melitensis infection might spread to our goats where it would find its normal host. The Brucellosis Melitensis Order of 1940 is fairly drastic so far as it goes, but its provisions can be applied only after the organism has been discovered, which might be not until a human outbreak of disease had occurred. But since all species of brucella are destroyed by pasteurisation we have an obviously efficient means of prevention so far as commercial milk is concerned.

"Epidemiologists have for some years recognised the possibility of *Br. abortus* producing an epidemic disease of man of some consequence, because of the known danger of *Br. melitensis*; but up to now epidemics of the latter have not been considered. Malta fever is less likely to be missed than abortus fever, for it is usually more severe. If the disease is suspected the diagnosis can be settled by the serum reaction, and it should now be a routine in cases of continued fever in which Widal reactions are sought to carry out the examination for the brucellosis reaction if that for the typhoids is negative or inconclusive."

* * * * *

"WALLOWING IN MAIZE"

An agricultural journal observes, under this heading, "We have drawn our readers' attention repeatedly to the paradox that while our farmers would give anything for a few tons of maize to-day for feeding pigs, poultry or other stock, Argentina, which is the world's biggest exporter in normal times, is now literally wallowing in a surplus of this great feeding medium. After last year's crop was gathered Argentina had a surplus of embarrassing dimensions. Now she is reaping another huge crop and her supplies will become so much more unwieldy. The Government of Argentina estimates that the carry-over from the old crop is about 29,000,000 quarters. On top of that, despite a reduced area grown, the new crop has bulked abundantly and is being estimated at 46,000,000 qrs. Allowing for all home needs, this means that the surplus will rise to something like 70,000,000 qrs. of maize, a reserve upon a scale never previously approached or even contemplated. The measure of that reserve will be judged when we state that the *Corn Trade News* says that it would be adequate to meet the full import requirements of Europe, including ourselves, for 2½ years. Put that statement alongside the fact that Canada has wheat reserves equal to three full years' needs of the British market, and it will be appreciated that in cereals the world is safe to-day provided shipping services can be maintained."

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

Correspondents submitting letters for anonymous insertion must forward their names and addresses for the information of the Editor; otherwise their communications will not receive consideration.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

THROMBO-ANGIITIS OBLITERANS IN A HORSE

To the Editor of the Veterinary Record

Sir,—In *The Veterinary Record* of May 3rd I read with very great interest an abstract from *The Journal of Pathology and Bacteriology* describing a case of thrombo-angiitis obliterans—the so-called Buerger's disease of man—affecting the main arteries of the hind legs in a horse. My special interest arises from the fact that

between five and six years ago I had the misfortune to be affected with this rare and distressing condition. Since then, naturally, I have been on the watch for any notice of its occurrence in animals. Naturally, also, I turned from your only too brief abstract to the original article by Innes and Whittick.

I have never had the opportunity of studying the disease, my knowledge of it being limited to the manner in which it affected myself. I am not surprised that until now there has been no reference to it in veterinary literature, because the symptoms—except perhaps in advanced cases—are almost purely subjective. Possibly it would not bore your readers too much, and might help to an understanding of the disease, if I were to give a brief account here of the symptoms as they affected me. Whether season has anything to do with the occurrence of Buerger's disease I do not know, but in my case the month was February. The onset was quite sudden. There came a feeling of extreme and painful coldness in my left foot. In appearance the foot was blanched almost white, and the greater part of it was quite insensible to touch. These symptoms did not abate with exercise; rather my impression was that they were aggravated. I had no lameness, but walking induced a steadily increasing discomfort which I am sure would have developed into lameness of an acute sort if I had continued beyond, say, half to one mile (I can only describe the discomfort by saying that the foot felt dead). Innes and Whittick say that the mare which was the subject of their article showed no lameness, and they suggest that this was because she was not doing any work—implying, I take it, that strenuous exercise would have brought out lameness. That appears to be supported by my experience.

The symptoms as they affected me were not continuous. When I sat in a warm room they disappeared almost entirely. The worst time of all was when I went to bed, because then the pain began in the foot, so severe and unremitting that, apart from taking soporifics, I could only get sleep by sitting all night in a chair.

The pulse in the left posterior tibial artery was very small and thready compared with that in the right posterior tibial.

I would not trouble your readers with all these personal details, but they are necessary to show that however real the symptoms of Buerger's disease are to the subject, they are not of a nature that will be readily observed by an onlooker. Particularly, their occurrence in animals would easily escape notice. I can only suggest, as your annotator does, that lameness of the intermittent sort associated with arterial occlusion should be regarded as suspicious, especially, I would add, if it affects one hind leg only. I say one leg, because, although in the mare referred to thrombosis had extended to the aorta and both hind limbs were affected, I understand that usually Buerger's disease attacks one leg only. Possibly, if advancement of the process is slow and allows adequate collateral circulation to develop, thrombosis may spread to the aorta and involve the other hind limb.

The aetiology of the disease is not accurately known. Among humans excessive smoking is thought by some observers to be a contributory factor. I had believed that only males were susceptible, but I learn from the article that rare cases have occurred in women. In the present instance, also, the animal affected was a mare. A peculiar feature is that the disease appears to be more prevalent among Jews than among other races.

Various treatments have been applied, but in many cases occlusion of the arteries is so complete as to cause gangrene, calling for amputation of the limb. Several other surgical methods have been tried or recommended, including, I believe, a formidable surgical interference in the pelvic ganglia of the sympathetic system. Treatment on medical lines is often adopted, such as the induction of protein shock. I understand that Buerger himself devised a system of exercises for the alleviation of the condition.

While the disease is probably rare in animals as in humans, the fact that it has now been recorded may lead to the recognition of other cases, and much that is at present obscure may be clarified.

Yours faithfully,
Donald Campbell.

Rutherglen.
May 11th, 1941.

* * * * *

TREATMENT OF TEMPORARY INFERTILITY IN COWS

To the Editor of the Veterinary Record

Sir,—As one who has extensively practised the technique for the treatment of temporary infertility in cows for many years, I would like to add to the suggestions made in the supplement to *The Veterinary Record* of May 17th, 1941.

I must first say that, in my opinion, a considerable amount of experience is necessary before one can get 75 per cent. success. All veterinary surgeons contemplating carrying out, on a large scale, the treatments suggested, should become well acquainted with the anatomy and feel of the uterus and its appendages. This can be done, especially at the present time, at the local centralised slaughterhouses where several cows and heifers are killed every week. Probably a large number of cows have been killed because of sterility and a lot of useful information can be obtained if one is present when these are slaughtered.

I note that no mention is made of the Fallopian tubes, a careful examination of which will reveal if the treatment is likely to be useless or has some chance of success. In my opinion if the tubes are not normal it is useless and a waste of time to attempt any uterine treatment and the farmer should be advised to fatten or sell the animal as soon as possible.

With regard to the use of vulsellum forceps, these should *not* retract the cervix more than necessary—I have seen the cervix pulled out of the vulva—only sufficient force should be employed to steady the cervix to enable the catheter to be passed. It should not be necessary to use vulsellum forceps to help one to find the ovaries.

With reference to haemorrhage resulting from expression of the corpus luteum, if the ovary is still held for about 30 seconds after expression any haemorrhage will be stopped and this should always be done as a routine practice.

As regards instruments, one should always have a vaginal speculum, an electric head lamp, a 2-way catheter, rubber tubing and douche can in addition to those mentioned. The most suitable clothing is a rubber parturition overall (Draper's) and rubber boots. Rubber gloves should not be used, vaseline is best. Soap should not be employed as a lubricant for the hands and arms, as after about six cows have been dealt with the appearance of one's hands will not be very flattering.

On several farms in my practice every cow is examined 14 days after calving and any necessary treatment is carried out. Not only is valuable time saved by this method but on these farms rarely has a cow to be fatted or sold for sterility. If dairy farmers could be educated to this method I am sure it would pay them in the long run, and would help to justify the scheme.

Yours faithfully,
H. J. Loveless.

Pier Avenue,
Clacton.
May 9th, 1941.

* * * * *

FOETAL ABNORMALITIES

To the Editor of the Veterinary Record

Sir,—Referring to the cases written of by Messrs. Smythe, Robertson and Margarson, may I be allowed to relate the following. In the spring of 1917 I was called to calve

three heifers on the same farm within a few weeks of each other. In two of these the calves were of the "inside out" type. The third was a "wryneck" with anchylosed vertebrae, and its tail was curled over its back in a complete ring which was as rigid as a quoit. All three cases necessitated an embryotomy, and at the third the farmer remarked thoughtfully to me "each of these was served by that young pedigree bull of mine, and he has served five others belonging to three of my neighbours." A little later, and all within about two months, I was called to five cases at these three farms, two of which were in cows and three in primiparae. Of these, three were apparently normal though very small calves, but in two there were breech presentations, whilst the remaining two were monstrosities of the "inside out" variety. The young bull, which was an obviously well-bred Shorthorn of good type, was carefully examined, but I failed to find anything abnormal or ill-developed in the genital organs, nor was there any history of injury. He had been bred by the farmer, and his own sire was also on the farm and producing normal stock. The owner, and indeed all of us concerned, naturally accused this tyro Taurus of being responsible for these five grotesque examples of biological architecture, and his paternity career was ended by torsion forceps. I do not know the views of embryologists as to where the blame for these freaks lies, whether in defective ova or spermatozoa, but this series of cases would seem to lend support to the theory of Mr. Margarson, that a known or unknown defect in the male organs of generation can give rise to them. In nearly 40 years of practice in the same district, I met with only two other cases of this *schistosomus reflexus* type, but I think it is not at all uncommon.

Yours faithfully,

E. P. Edwards.

"Rhianfa,"
Prestatyn,
N. Wales.
May 11th, 1941.

• • • • •

ACID FIRING

To the Editor of the Veterinary Record

Sir,—I have no desire to prolong, or add to the discussion on the firing question. This, I think, has been thoroughly thrashed out by the members. I had hoped, however, that the question of acid firing would be brought to light by at least one veterinary surgeon. Some years ago I inspected a hunter belonging to the late Lord Stanley which had broken down in the hunting country. This horse had been treated by the above method. It certainly looked a very neat, also a spectacular, piece of work. It appeared to me to be a nice easy arm-chair method of application, capable of being applied by the operator without any loss of energy. I should like to hear more about this method: which acid is used; what are the results, compared to the actual cautery, etc., etc.

Yours faithfully,

P. J. Turner.

68, Newstead Road,
Southbourne,
Bournemouth.
May 17th, 1941.

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th April, 1941	27	27	19	1,764	1	6	7	45	21
Corresponding period in ...									
1940	23	23	2	155	1	1	10	206	161
1939	42	46	—	—	2	6	1	67	51
1938	54	59	28	3,221	4	9	3	21	22
Total 1st January to 15th April 1941	163	175	195	19,238	7	21	99	599	284
Corresponding period in									
1940	183	196	17	2,521	11	23	101	1,126	685
1939	304	326	29	4,357	21	42	140	405	247
1938	313	329	141	18,379	36	58	85	117	

Note.—The figures for the current year are approximate only.

§Excluding outbreaks in Army Horses.